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Comparative study of the mesoprepectal area in Hymenoptera

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ABSTRACT : In Pamphiliidae, Xyelidae, Diprionidae and Tenthredinidae, mesoprepectus is a small area that varies in shape. In Cimbicidae, Cephidae and Xiphydriidae, though this area varies in shape, yet it is prominently represented. In Siricidae, it is again quite inconspicuous. In Chalcidoidea, this area forms a prominent subdivision of the mesopectus and ultimately in Ichneumonoidea, it has reached the climax of its development covering more than half of the latero-ventral aspect of the mesothorax. In rest of the apocritan families like Chrysididae, Scoliidae, Sphecidae, Vespidae, Eumenidae, Pompilidae and Apidae, it has gradually lost prominence and ultimately totally absent in Formicidae.

Earlier, Snodgrass (1910) stated that "beginning of the mesoprepectus is to be found in the Ichneumonidae". His observations were confined only to a few families of Hymenoptera. Later, this area was dealt on ontological basis (Bird, 1926; Alam, 1951; Arora, 1953, 1956; Rivard, 1955; Wong, 1963; Dhillon, 1966; Jonathan and Gupta, 1973). However, a comparative study presented in this contribution highlights an evolutionary cycle indicating the appearance, progressive evolvement followed by a gradual diminishment up to the complete loss of the mesoprepectus in the entire range of order Hymenoptera.

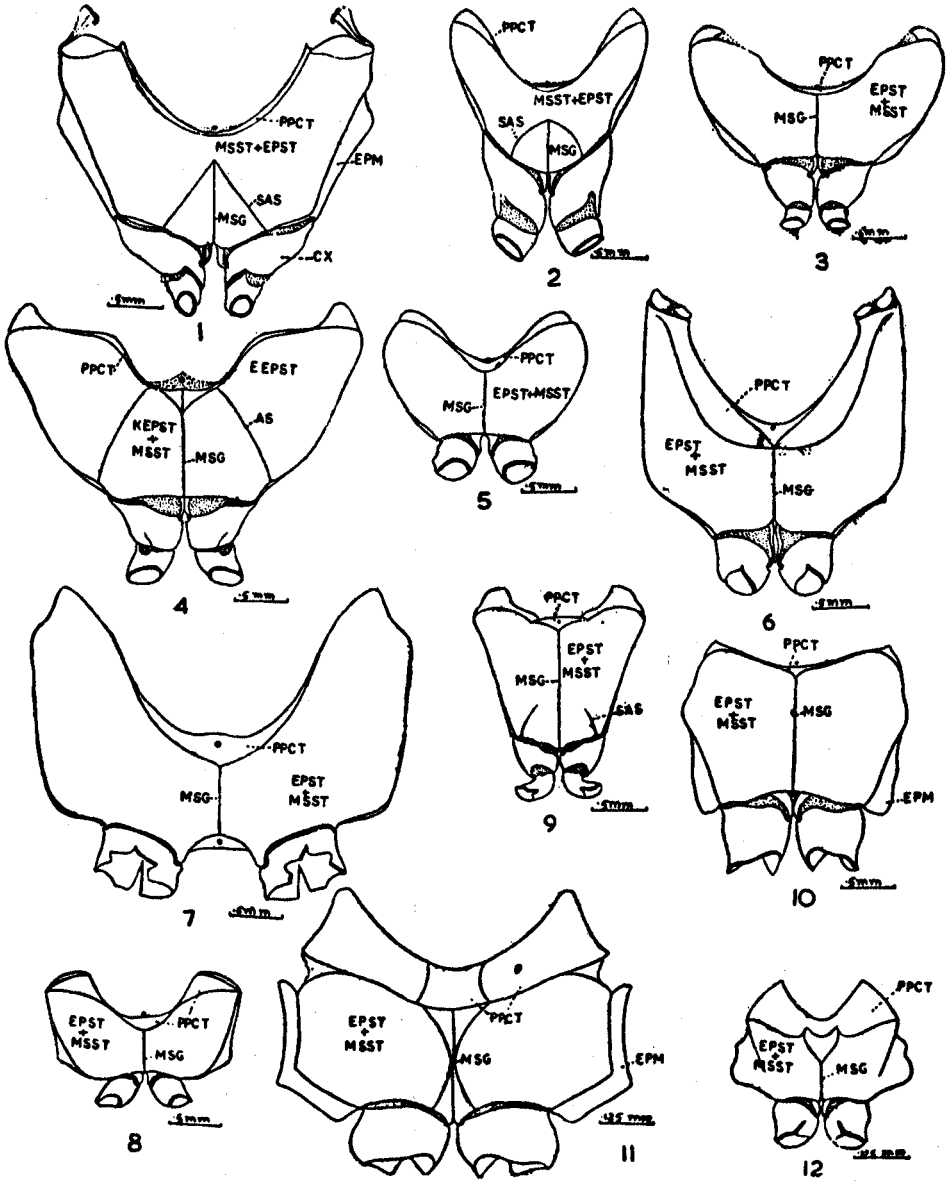
MATERIAL AND METHOD

Most of the specimens of Apocrita were collected from the Punjab and Himachal Pradesh states during September and October, 1975 and preserved in 80 percent alcohol. Symphyta, with the exception of Megalodontidae and Orussidae, were supplied by the Biosystematic Research Institute, Canada, and the Zoological Survey of India. As the specimens were dry, these were softened by immersion in 2 per cent KOH for about six days. Figures were drawn using a stereo-microscope fitted with an ocular micrometer.

OBSERVATIONS AND DISCUSSION

In its highly developed form, as observed in Hymenoptera Parasitica, mesoprepectus is a girdle shaped sclerite that forms an anterior subdivision of the entire mesopectus. However, on the basis of the comparative study, the beginning or origin of this sclerite is to be found right in the primitive symphytans. Again, in the higher apocritans, it loses its independent identity. Hence, the appearance, gradual prominence and again losing its independent stature are the main points which indicate an evolutionary cycle. The coherent account of these observations is as follows :—

In *Acantholyda maculiventris* (Norton) (Fig. 1) (Pamphiliidae), *Xyela bakeri* Konow (Fig. 2) (Xyelidae), *Arge clavicornis* (F.) (Fig. 4) (Argidae), *Neodiprion abietis* Harris (Fig. 3) (Diprionidae) and *Pristiphora cincta* Newman (Fig. 5) (Tenthredinidae), the mesoprepectus is represented by a small area that varies in shape. In some, it is a small triangle (Fig. 3) situated at the anterior tip of the median sternal suture, in



ASU—Anapleural suture; CX-Coxa;
EEPST—Enepisternum; EPM—Epimeron;
EPST—Episternum; KEPST—Katepisternum;
MSG—Median sternal groove; MSST—Mesosternum;
PPCT—Prepectus; R-Ridge; SAS—Secondary anapleural suture.

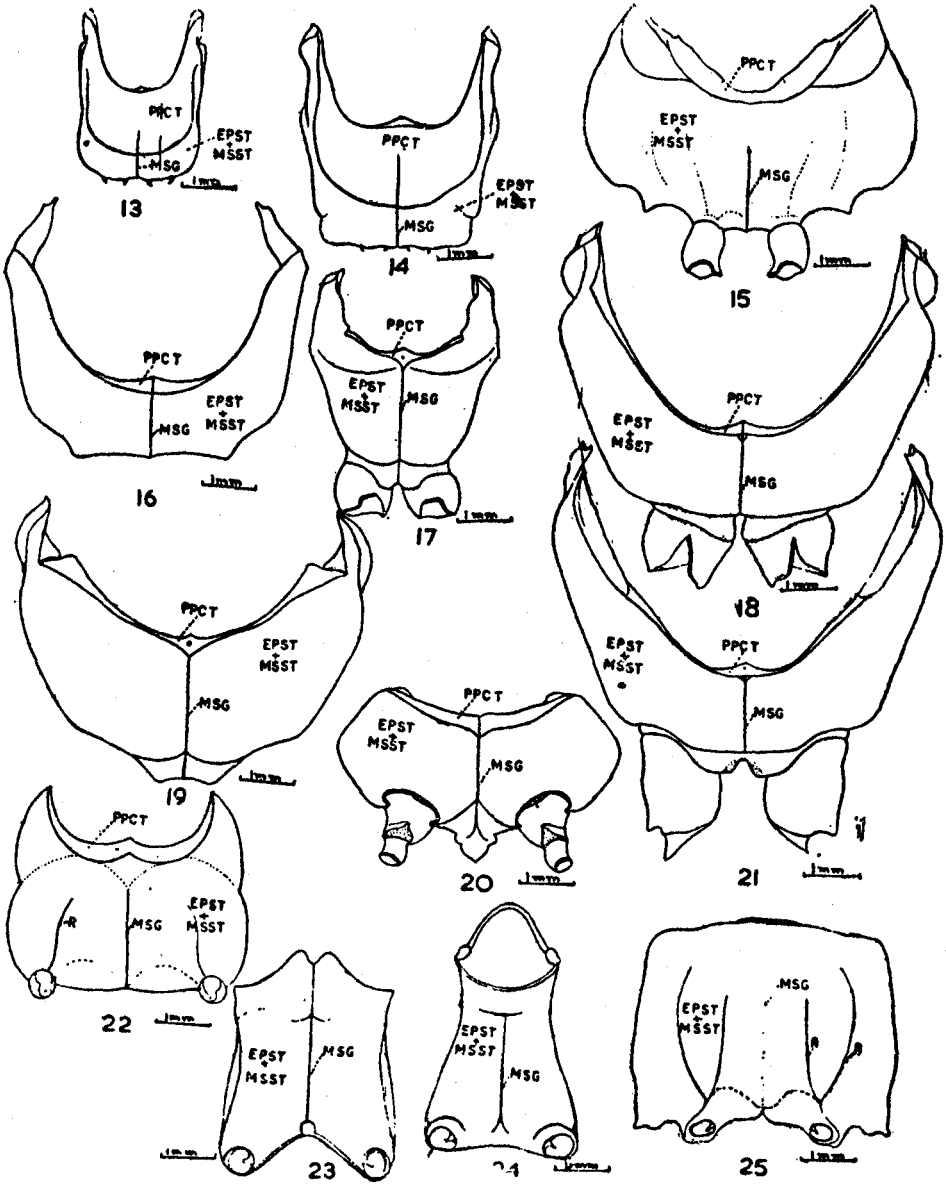
Figs. 1-12 Ventral view of the mesopectus :
1. *Acantholyda maculiventris*, 2. *Xyela bakeri*, 3. *Neodiprion abietis*, 4. *Arge clavicornis*, 5. *Pristiphora cincta*, 6. *Xiphydria mellipes*, 7. *Cimbex americana americana*, 8. *Tomostethus assomensis*, 9. *Cephus (Cephus) cinctus*, 10. *Sirex cyaneus*, 11. *Sycoscapter stabilis*, 12. *Sycophilla decatomoides*.

others in the form of a continuous thin strip present along the entire anterior margin of the mesopectus (Figs. 1, 5) and in still others, by the combination of the above two types (Fig. 4). Similar observations have also been made in *Pamphilius luteicornis* Norton and *Cephalcia provancheri* Huard (Pamphiliidae), *Tomostethus* (*Eutomostethus*) *assomensis* Rohw., *Pachyprotasis versicolor* Cam. and *Pachyprotasis brunetti* Rohw. (Tenthredinidae). These observations are further substantiated by the studies made by Rivard (1955), Bracken (1961), Wong (1963) and Dhillon (1966). However, Snodgrass (1910), Bird (1926) and Arora (1953, 1956) have not given any account of this area in the different symphytans studied by them.

In some other symphytans like *Cimbex americana americana* Leach (Fig. 7) (Cimbicidae), *Cephus* (*Cephus*) *cinctus* Norton (Fig. 9) (Cephidae) and *Xiphydria mellipes* Harris (Fig. 6) (Xiphydriidae), the mesoprepectus is prominently represented. In the first case, it is in the form of a conspicuous triangle lying in front of the median sternal groove, while in the second, it is represented by a median triangle and two rectangular areas, one lying on either side of the triangle. In the third case, this area is in the form of a prominent broad strip skirting the entire anterior side of the mesopectus and like *Cephus* (*Cephus*) *cinctus* (Fig. 9), it is clearly divisible into three areas, one median triangle and the two lateral rectangles. However, in this case, the lateral rectangular areas are continuous with each other on the posterior side of the triangle. In *Sirex cyaneus* F. (Fig. 10) (Siricidae), the prepectal area is quite inconspicuous. This modification can be taken as of secondary nature, thus, indicating Siricidae as an off-shoot from the main stem of evolution that went straight from the cephids to Hymenoptera Parasitica.

Further modified conditions are observed in Hymenoptera Parasitica. In *Sycoscapter stabilis* (Walker) (Fig. 11) (Torymidae-Chalcidoidea) and *Sycophila decatomoides* Walker (Fig. 12) (Eurytomidae-Chalcidoidea), mesoprepectus constitute a prominent subdivision of the mesopectus. Like *Cephus* (*Cephus*) *cinctus* (Fig. 9), in both these chalcids, the area is further subdivided into three main regions i.e., one median and two lateral. The former is small and rectangular, situated anterior to the median sternal groove and is sandwitched by the remaining two laterally placed areas, which too are rectangular in outline. Similar conditions have also been observed in *Blastophaga masoni* Saunders (Agaonidae) and *Walkerella temeraria* Westwood (Torymidae). Snodgrass (1910) has also shown a well developed mesoprepectal area which exhibits a variety of shapes and sizes in the different species of chalcids, he studied.

In the members of Ichneumonoidea like *Netelia kashmirensis* Cameron (Fig. 13) and *Trachysphyrus* sp. (Fig. 14), mesoprepectus is considerably developed and forms a band lying anterior to the mesopectus. The above observations are also substantiated by the similar studies made by Snodgrass (1910), Alam (1951) and Jonathan and Gupta (1973). However, according to Snodgrass (1910), beginning of the mesoprepectus is to be found in Ichneumonidae. But the present study reveals that the formation of this plate starts from the very primitive symphytans and it attains a maximum size at the level of Hymenoptera Parasitica. In other apocritans such as *Chrysis indogotea* Duf. et Pesr. (Fig. 15) (Chrysididae), *Scolia quadripustulata* Fabr. (Fig. 16) (Scoliidae), *Sceliphron intrudens* Smith (Fig. 17) and *Stizus vespiformis* Fabr. (Fig. 19) (Sphecidae), *Vespa orientalis* Linn. (Fig. 18) (Vespidae), *Eumenes dimidiatepennis* Sauss. (Fig. 21) (Eumenidae), *Calicurgus* sp. (Fig. 22) (Pompilidae) and *Xylocopa lemuiscapa* Westwood (Fig. 20) (Apidae), the mesoprepectal area goes on reducing. Leaving aside *Chrysis indogotea*, where it is slightly prominent, in all other cases, it is represented by a narrow thin strip, the shape of which varies from species



Figs. 13-25. Ventral view of the mesopectus :

13. *Netelia kashmirensis*, 14. *Trachysphyrus* sp., 15. *Chrysis indogotea*, 16. *Scolia quadripustulata*, 17. *Scelephron intrudens*, 18. *Vespa orientalis*, 19. *Stizus vespiformis*, 20. *Xylocopa lemuiscapa*, 21. *Eumenes dimidiatepennis*, 22. *Calicurgus* sp., 23. *Sima rufonigra*, 24. *Camponotus camelinus*, 25. *Dorylus labiatus*.

to species. In some members of Vespidae, Eumenidae and Apidae, it is even semisclerotized.

In the members of family Formicidae like *Dorylus labiatus* Shick (Fig. 25), *Camponotus camelinus* Smith (Fig. 24) and *Sima rufonigra* Jerdon (Fig. 23), the mesoprepectus has lost its independent identity.

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